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The Florida Citrus Exposition, Winter Haven, Jan. 15-22

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36 — No. 1

UARY, 1955

Insect Control
January, 1955

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January 15

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SCIENCE AND INDUSTRY

Citrus Is "Big Business"

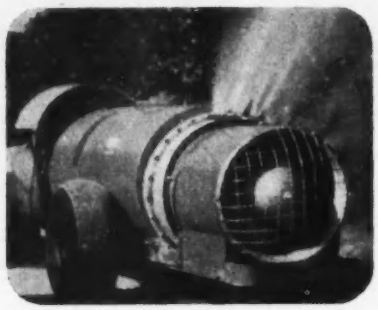
If anything were needed to substantiate that statement the recent purchase of Snow Crop interests by the Minute Maid corporation is abundant proof. In a forty million dollar deal Minute Maid acquired all the holdings of Snow Crop in Florida, including concentrate plants, by-products plants and control of vast acreage of producing groves.

This doubtless is the greatest deal ever made anywhere in the citrus industry and places Minute Maid in the forefront of citrus organizations and the leading organization in the production of citrus concentrates.

Just what effect this acquisition may have on the citrus industry as a whole is a matter for future demonstration. There are really three schools of thought: One, that it will prove beneficial to the entire industry; two, that it will have little or no effect outside the two organizations affected; three, that it may prove detrimental by reducing competition. Which of these forecasts may prove correct the future must determine. But it conclusively demonstrates that citrus production, packing, canning and marketing is Big Business.

Whether for good or ill, the day of the one-man operator in the citrus field is past. Citrus has ceased to be a vocation for the tired business man who wishes to retire to a five-acre grove and has become a business proposition of the first magnitude.

XUM



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Citrus Insect Control

R. B. Johnson

For January 1955

W. L. THOMPSON,
R. M. PRATT
R. B. JOHNSON*
Florida Citrus Experiment Station, Lake Alfred

W. L. Thompson

Past records have shown that heavy six-spotted mite infestations occur in seasons following cold Decembers. This year, the average temperature through December 20 was the lowest in many years and it is to be expected that infestations of this mite will be general and severe in the coming spring. Six-spotted mite is more of a problem on grapefruit than on oranges, and infestations tend to recurr in the same groves each year that infestations are general. The West Coast District has been more heavily infested than other areas of the state in the four years for which detailed records are available.

There are also some indications that mealybug infestations are more abundant following low December temperatures.

Activity of both red and purple scale was high through November and the first week in December. The highest average infestation of red scale was intermediate between the high level of November 1951 and the low fall infestations of the last two years. Purple scale infestations the first week in December were the highest reached in the fall months during the five seasons of record.

Activity of both scales has declined sharply in the last two weeks and will probably be fairly low in January.

Purple mite activity has increased slowly during the past two months and reached a high level in mid-December. Activity has been higher in the southern and coastal districts than in the northern interior districts. Infestations will probably average fairly high in January.

Rust mite activity was moderately high in December and will probably continue to be high in January on the leaves, but a considerable decline is expected on the fruit.

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* Written December 22, 1954. Reports of surveys by Harold Holtsberg, Cocoa; J. W. Davis, Tavares; K. G. Townsend, Tampa; J. B. Weeks, Avon Park, and T. B. Hallam, Lake Alfred.

Spray Program

A preliminary spray program for the the year should be made up in January or just before the spring tions can be made as the season progresses. Before making up the program, all groves should be checked for scale insects, mealybugs, and the various species of mites. During Januray or just before the spring flush of growth the groves can be graded for scale infestations and mealybugs. When checking for scale, inspect the leaves, green twigs, and fruit. If there is an unusual amount of scale, plans should be made to treat before the spring flush, and for less severe infestations the treatment may be delayed until the post-bloom period, at which time there is a higher percentage of scale in the younger stages than is usually found during the winter months. If scale is not noticeable, then the scalicide can be delayed until the regular summer sprays are applied. Inspections for mealybugs should also be made. Inspect the trunks of the trees for egg masses or active mealybugs. These insects may also be found under the button of the fruit, especially late bloom fruit. Where any sooty mold is noticed around the stem end of the fruit an inspection for mealybug should be made. A dormant application of parathion has been very effective in preventing heavy infestations in the spring.

Six-spotted mites build up on old leaves during December and January and move to the new foliage in the spring. When checking groves, the under surfaces of the leaves with yellow areas on them should be inspected, paying particular attention to the area around a colony of purple scales as these mites are often found feeding in that area. A dormant miticide reduces the likelihood of a spring infestation.

Purple mite infestations have been general this winter and control has not been very satisfactory because of showers occurring within a week or ten days after the application. For that reason many groves are now infested even though a November or December miticide was applied. If mites are present in January, they should be controlled to keep the young foliage free of them until the post-bloom spray can be applied. Inspect the tops of some trees if mites inspections are usually made.

Rust mite inspections are just as necessary in groves that have been picked as in those where the crop is still on the trees. The heavy infestations on leaves and green twigs can cause a leaf drop similar to that caused by purple mites. If the mite population is reduced to a low level just before spring growth starts, there is not so much danger of early rust mite injury should the post-bloom spray be delayed for some reason. A low mite population at the time of the post-bloom sulfur spray will also insure a longer period of control than where there is a heavy infestation at the time of treatment. Inspect the tops of trees if mites are not found on lower limbs.

Scale Control: In groves where infestations of either red or purple scale exist, an application of 1 2/3 pounds of parathion should be used. Sulfur and other materials needed for insect or mite control or nutritional purposes can be added if desired. If oil is to be used the application should be made in late January or in February if the spring growth has not started. If it does not take more than a few days to spray the grove it is better to delay the oil sprays until there is pin-point growth rather than to risk spraying the grove with oil and have freezing weather following the application. An oil emulsion spray should not be sprayed on Valencia trees if the crop has not fully colored because it will prevent degreening. The inclusion of a scalicide in the dormant spray does not eliminate the need for scale control during the summer.

Mealybug Control: Parathion is very effective in controlling mealybugs. Use parathion at 1 2/3 pounds per 100 gallons and make a very

(Continued on page 22)

XUM

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World's Greatest Citrus Exposition Opens Jan. 15

The Florida citrus industry will send a beautiful and glamorous "ambassador" to Europe early in the spring to promote the sale of fresh and processed oranges grapefruit and tangerines, it was revealed here today.

The girl to be selected as the 1955 "Florida Citrus Queen" during the Florida Citrus Exposition will receive the assignment of flying to Europe to appear before trade and import groups with special attention to The Netherlands, Belgium and West Germany.

Jack M. Berry, Exposition president, said arrangements have been completed to send the 1955 Florida Citrus Queen, with a companion of her own choice, to Europe via Royal Dutch (KLM) Airlines, with her schedule to be worked out in cooperation with Florida citrus export interests, arranging visits where there are merchandising potentials.

The air travel arrangements were worked out by Tom Moore, start of the Florida Citrus Commission's "Florida Calling" radio show, in cooperation with his New York agent and the FCC.

The 1955 citrus queen contest will be in three phases, Monday, Tuesday and Wednesday nights, Jan. 17-18-19, and will be open to any Florida girl, including non-resident students registered in Florida's institutions of higher Queen" contest, Monday, Tuesday and learning. Entrants must be over 18 and under 25 years old, on Jan. 17, and must be unmarried. Sponsorship of girls in the contest is open to any civic, fraternal, veterans', commercial or other organization or firm.

Girls competing for the coveted "Florida Citrus Queen" title will be judged on beauty, poise, personality and talent, the latter qualification designed to give contestants an opportunity to show their ability to appear before large and varied audiences and to demonstrate their speaking voices.

Complete rules and regulations for the contest, as well as entry blanks, are available to prospective contestants and sponsors at the Exposition offices here, Berry said.

"The annual Florida Citrus Queen Contests, with their valuable awards, including European trips, have come to be recognized as second in importance only to the 'Miss America' competitions," Berry commented.

The observance of the traditional "special days" and events during the 1955 Florida Exposition at Winter Haven Jan. 15-22, will attract many large groups, it was predicted by Jack M. Berry, president of the industry-sponsored show.

The parade scheduled for Monday, Jan. 17, will be routed so that additional thousands of people can see it over the long line of march, and the three phases of the annual "Florida Citrus Wednesday nights, Jan. 17, 18 and 19, are expected to tax the capacity of the huge Lake Silver ampitheater.

The first big special day during the show's run will be Wednesday, Jan. 19, when the citrus industry will pay tribute to "Florida's grand old man of agriculture", Commissioner of Agriculture Nathan Mayo. That night the new "Florida Citrus Queen" will be the guest of honor at the annual "Coronation Ball", a formal and invitational event which is sponsored by The Florida Club.

"Fresh Fruit Day" will be observed on Thursday, Jan. 20, with a special program, including awards of prizes and ribbons in the big "fresh fruit contest", and climaxed by the "Fruitmen's Dinner", a stag event which annual attracts 1500 to 2000 industry men from all over the state.

Florida's new governor, LeRoy Collins, will be honored on Friday, Jan. 21—marking what probably will be his first official visit to this section as Florida's chief executive. Topping off the day will be the gridiron-type "Press Breakfast" which usually has a political slant in its skits staged by working newsmen from over the state. George L. Burr, Jr., publisher of the Winter Haven Herald, will again be in charge of the program for this event.

Phil E. Lucey, general manager of the Exposition, said that new developments in pyrotechnics will be embodied in the nightly fireworks displays presented on Lake Silver.

XUM

Observations On The Biology Of The Citrus Tree Snail

MARTIN H. MUMA
ASSOCIATE ENTOMOLOGIST,
FLORIDA CITRUS EXPERIMENT
STATION, LAKE ALFRED

Introduction

Many citrus groves in the state of Florida are populated with the citrus tree snail or Manatee snail, **Drymaeus dormani** (Binney). Although the heaviest concentration of "snail groves" occurs in Lake, Orange, Marion and Sumter Counties such groves can be found in almost any citrus growing area of the state. Many citrus growers maintaining a biological control program or a modified spray program have this snail in their groves and believe it to be of value in controlling the injurious insects and mites. For this reason research on the biological control of citrus insects and mites in Florida must, of necessity, include work on this species of snail.

The citrus tree snail was first described 97 years ago from material collected near St. Augustine, Florida. Since that time it has been listed in many technical publications on land snails. Few publications, however, have been devoted entirely to the snail. Only five have come to the author's attention. In 1906 C. T. Simpson published a technical account of **Drymaeus dormani** (Binney) and allied species in Manatee County, Florida. The first account of this snail in citrus groves was published by E. A. Sellers in 1906 and was a press bulletin describing the removal of sooty mold by snails. In 1947 R. E. Norris published an observational paper on the snails in Lake County citrus trees. J. T. Griffiths, Jr., in 1949, published a preliminary report on the tree snail in citrus groves in Florida. The last account to appear was a privately printed paper by F. C. Kramer, Jr., in 1952 entitled "My Experience with Citrus Tree Snails." With exception of Griffiths all workers to date have made claims concerning the benefits of the citrus tree snails in controlling citrus insects and mites. These claims have varied from that of Sellers who stated that the removal of sooty mold from the trees was of value, to that Kramer who reported reduction in scale and mite population due to snail activity. Griffiths' paper included some biological notes on the snail but was primarily a comparison of snail infested and noninfested groves. In this comparison he pointed out that no difference in production and only a slight difference in production cost could be attributed to the activity of snails. Griffiths concluded that further data would have to be collected before the value of the snail could be determined.

Since 1951 the author has been conducting a series of observations and experiments on the biology and possible value of the snail. The following remarks are concerned mainly with the biology of the species.

Life Cycle and History

Citrus tree snails in all stages of development feed on sooty mold and on green algae but have not been observed to feed extensively on any of the other many fungi that are found on citrus trees in Florida. Snails feed when abundant moisture is present on the leaves, fruit, limbs, and trunk. This condition occures at night or during rainstorms. Since 1951 snails have been observed feeding every month of the calendar year. Feeding is at its lowest in December, January and February with activity limited to warm wet periods.

During the months of November, December, January, February and March most of the snails are in a state of hibernation. With the onset of cool weather in October, most of the snails begin migration to hibernation quarters. They have been found to hibernate in cracks and crevices on the tree, under leaves on the ground, and under paper or cloth sacks hung in the crotches of the trees by growers. During hibernation the snail retreats within the shell and secretes a hard glue-like film over the open end. This film apparently reduces moisture loss and during the past three winters has resulted in successful hibernation of most individuals. The effect of cold weather on snail populations is not known.

In late March, April and May the snails again become active and move from hibernation quarters back onto the tree. Feeding seems to occur principally on the trunks, limbs and twigs, during the period immediately following hibernation. Many snails, however, have been observed to crawl out onto the leaves and feed on sooty mold. With the onset of spring and summer rains the snails descend to the bases of the trees and lay their eggs in huge masses in the sand and under the leaves. Early in the egg laying period it is possible to obtain accurate counts on the number of snails eggs deposited at a single laying. This is not possible later in the egg laying period as the snails apparently are gregarious, grouping together and laying huge masses of eggs. Counts made on the early egg masses indicate that they vary from 40 to over 400 per mass with an average of 119. The majority of the masses counted during this period varied from 50 to 250 eggs per mass. Although this is some indication of the reproductive capacity of the snail there is no assurance that each snail does not lay more than one mass of eggs during the egg laying period. In the three years during which the snails have been under observations by the author, egg laying has occurred from late May until late August. Egg laying apparently is not confined to the larger snails as individual snails as small as one-half inch in length

have been observed depositing eggs,

Although egg hatching data are not extensive at the present time it appears that eggs hatch in from one to two weeks and the newly hatched snails begin migration up the trees. Young migrating snails apparently do not feed to any large extent on algae and other fungi present on the the trunk but climb rapidly toward the water sprouts on the inside of the tree. Here they begin feeding on sooty mold.

No accurate data are available as yet on rate of growth but observations indicate that snails reach egg laying maturity in one season. That is, they grow from the hatching size of 1/16 of an inch to 1/2 inch in length in one active season. Snails measuring up to 1 1/4 inches have been found in groves that have been infested only two years. This would seem to indicate that the growth rate is relatively rapid and that maximum size is reached in a short period of time.

Predators and Parasites

In most snail groves observed over the past three years the snail population have fluctuated between approximately 500 per tree and slightly less than 100 per tree. Most workers have found that the populations reached their lowest ebb during the spring and early summer months, and their highest peak during the late summer and fall months. Although there has been much conjecture concerning this variation in snail population no cause has yet been found. Because of the wholesale removal of sooty mold and algae from the trees most snail grove owners have assumed that this fluctuation in population was caused by starvation during the early spring and summer months.

Over the past several years an extensive study has been made of possible predators, parasites and diseases of the citrus tree snail. Several have been found and are discussed in the following paragraphs.

Eggs.—The eggs are perhaps the most susceptible stages in the life cycle of the snail. They are laid loosely in the earth, on the surface of the earth, and may or may not be protected by leaves. In many instances the eggs have been found in the crotches of the trees, or even out on flat areas on the limb surfaces. Egg mortalities are caused by several factors. Dry weather during the egg laying season dessicates many eggs. Under laboratory conditions eggs dried out experimentally and watered returned to the normal shape but did not hatch. Some apparently dessicated eggs have been found to be infested with young earthworms. Earthworms apparently feed in and on the eggs destroying many masses in this process. Off-color white or yellow eggs do not hatch and apparently are infertile or diseased.

Newly Hatched Snails. — Although the newly hatched snails are probably quite susceptible to predators only one has been discovered, the young or partly grown predatory snail, **Euglandina rosea** Ferrusac. In the laboratory this predatory snail has been observed to feed rather voraciously on newly hatched snails. Ants, ground beetles, beetle larvae of various kinds, and earwigs are predatory but do not eat young snails. Other than the predatory snail the only factor known to cause decrease in newly hatched snails is drought. In several instances dead snails in the newly hatched condition have been found clinging to the tree trunks following extensive dry periods.

Young Snails.—Snails varying from 1/3 to 1/2 of an inch in length are also susceptible to the attacks of the predatory ground snail mentioned above. In addition, snails in this size range are attacked by two parasitic flies, **Johnsonia elegans** Ald., and

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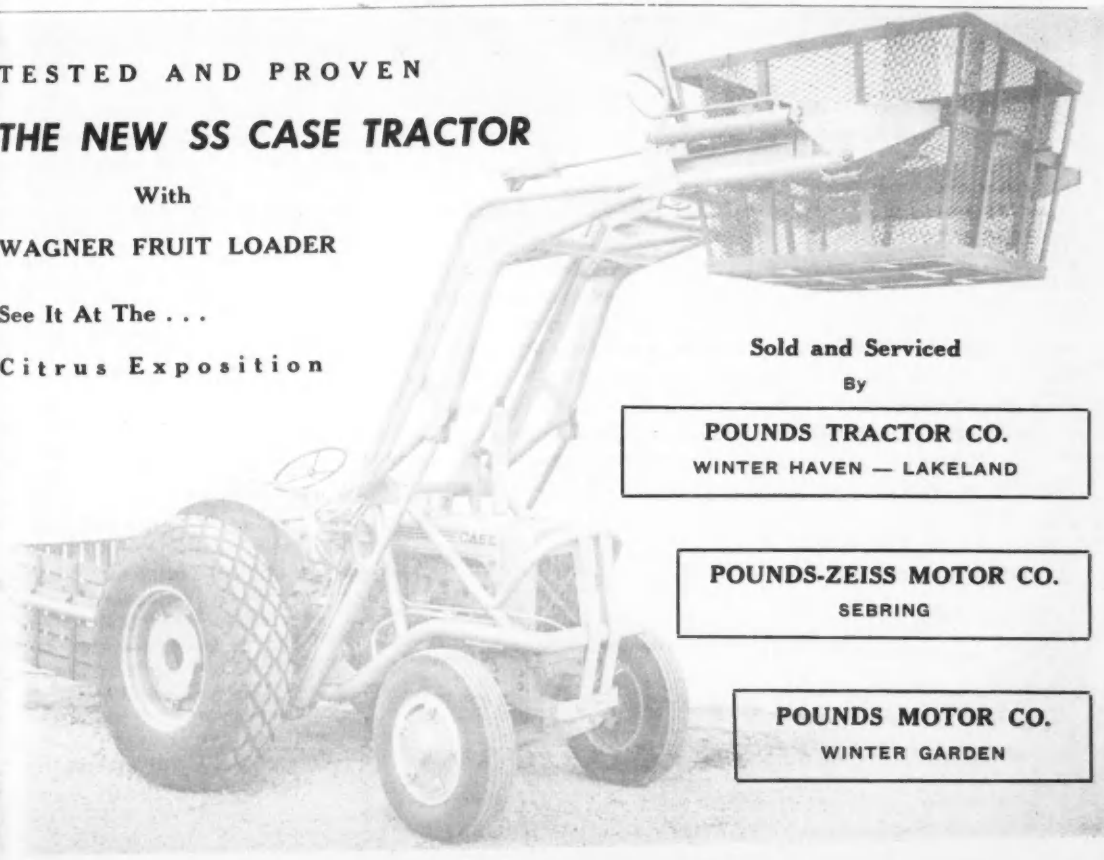

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Johnsonia sp probably **frontalis** Ald. Both of these flies are about the size of the housefly but have a yellow to orange abdomen or tail. To date only one fly maggot has been found in each parasitized snail. The maggot crawls between the shell and the snail body, feeding until it is mature. The maggot then pupates, changing to a fly within the shell, usually in the fourth whorl from the tip. Young snails afftcted by these parasites may be found clinging to the leaves, fruit, limbs, or trunk. Most commonly they are found on the limbs and trunks of the tree.

Older Snails.—Older snails, those measuring from 1/2 to 1/4 inches in length are attacked by several parasites and predators, and by two conditions believed to be diseases.

The predators known to attack these older snails are birds, mice and the predatory snail, **Euglandina rosea** Ferrusac. Birds, have been observed in large numbers, in a citrus grove under experimental observation, apparently feeding on the large snails. Many broken snail shells were found around on the ground during the time that these birds were active in the grove. The birds were not positively identified but appeared to be black birds or starlings. Mice have been observed to feed in rather large numbers on hibernating snails. In one case where cloth bags were used to provide hibernating quarters for the snails, mice got under the bags in the crotches of the trees, built nest materials, and ate the snails bodies out of the apical end of the shells. The predatory snail, **Euglandina** has been observed both under field conditions and in the laboratory feeding on large specimens of the citrus tree snail.

The two diseases or abnormal conditions that have been observed in snail groves are a condition called "green body" in which the snail body turns a brownish-green in color and a condition called "brown body" in which the snail body turns brown and dries up. Green body has not been observed throughout its development but it is believed that the brown, slimy, dead snails found very frequently in the spring and early summer represent the final effect. Brown body is found most frequently during the winter and it is possible that it is merely dessication.

In addition to the predators and abnormal conditions discussed above, the older snails are affected by four species of parasites. Two are grey and black flies, **Sarcophaga lambens**

Wd. and **Sarcophaga morionella** Ald., about the size of a housefly. After causing death of the snails, the solitary maggots of these two species then crawl out of the shell, drop to the ground, and pupate. Two small species of flies about the size of a vinegar gnat are also suspected of being parasitic on the citrus tree snail. They are **Hippelates dissidens** (Tuck.) and **Megaselia** sp. The first species is dark brown to black with red eyes, whereas the second species is dusty yellow with dark eyes and a wide dark brown stripe on the upper part of the abdomen.

From the above information it would seem that the citrus tree snail is very seriously affected by predators and parasites. However, in experimental groves predators, parasites and possible disease have not decreased the population of snails for any extended period of time. During the early and late spring, and sometimes early summer months rather large mortalities of snails have been observed, but by the fall months the snail population have again built-up and are at or near the usual peak level.

Snail Grove Management

Although this paper is primarily intended to give information on the life history, life cycle, and ecology of the citrus snail the past three years of research have revealed some aspects of snail grove management that might be of value to citrus growers. For this reason the following information is given but should be considered fragmentary and prelimary.

Grove Infestations.—Growers wishing to infest groves with the citrus tree snail apparently can do so in either of two different ways. Hibernating snails may be obtained from a grove already infested with the snails, and introduced into the new grove in the early spring months. It may also be possible to obtain eggs from an infested grove in the late spring and early summer, and infest additional groves with the eggs. These two methods of infestation have been tried at the Citrus Experiment Station and apparently are successful. The introduction of active snails has been suggested by some growers but no research has been conducted to determine just how successful this method might be. When infesting a grove with hibernating snails, they have been placed in the lower crotches of the tree, and covered with sacks for protection until the rains activate them. When infesting a grove with eggs, the eggs have been placed in

(Continued on page 21)

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"Spreading Decline" Of Citrus Continued

Distribution Of Burrowing Nematode *Radopholus Similis* In Florida

Following the discovery of the burrowing nematode, **Radopholus similis** (Cobb) Thorne 1949, as the cause of the Spreading Decline of citrus in Florida, one of the next logical steps was to determine the extent of this disease by means of a survey. This survey was undertaken late in January by the State Plant Board for two major reasons. First, because the magnitude of the survey required a considerable number of personnel, and second, to permit the members of the research staff of the Citrus Experiment Station concerned, to devote more of their time to research on the problem. Up to this time they had done a large amount of identification work and had listed some 147 groves as infested with the burrowing nematode and a large number of earlier identification had been made by determining the actual spread in suspected areas, but they had not been able to inaugurate any extensive survey. The total number of properties identified as infested was about 220.

Practically all of the grove properties surveyed to date have been surveyed at the request of the owners or the owner's representatives.

A grove to be surveyed for Spreading Decline is first inspected to determine if the trees in question show Spreading Decline symptoms. In a number of groves that the State Plant Board has been called on to inspect, the decline condition of the trees has been due to water damage, foot rot or some cause other than the burrowing nematode (1). Where the symptoms indicate the burrowing nematode may be present, the grove or the portion of the grove containing the damage is mapped. Symbols are used to distinguish diseased from healthy trees on the map as well as young resets and buckhorned trees.

Locations for taking samples are determined by a study of the map and the appearence of the grove. The samples are usually taken along the margin of the diseased area between the last decline tree and the first healthy tree at intervals of three to ten trees. The sample locations are indicated on the map. It should be pointed out that many of the types of decline produce similar symptoms in the trees and for this reason, prior to the finding of the nematode, identification could be made only after mapping the area for two successive years. This mapping established the presence or absence of spread and it was spread which distinguished this particular type of decline from other declines. It is inevitable that on a single observation many spots may be classed as Spreading Decline that are really related to some other cause and will turn up negative for the burrowing nematode in the laboratory

K. E. BRAGDON

R. W. HANKS
FLORIDA STATE PLANT BOARD
AT MEETING OF FLORIDA
STATE HORTICULTURAL SOCIETY

At the present time, the sample as taken consists of feeder roots collected at the tree drip line and to a depth of four feet starting at the subsoil. The root samples are placed in jars, capped, and taken to the laboratory where the roots are prepared for a microscope examination for the burrowing nematode. Prior to about the first of September the Baremann technique was used which included both soil and roots in the sample and was not very satisfactory. This method gave a much poorer recovery of the burrowing nematode than the newly developed method (2).

Those samples in which the burrowing nematode is found are considered as positive samples and those particular sample locations are so indicated on the grove map. Not all collected samples are positive by any means—probably because of chance distribution of the nematodes throughout the feeder root system. The significance of a positive sample is obvious; a negative sample does not mean that burrowing nematodes are not present and the grove must be resurveyed before classifying it finally as negative.

Up to October 1, 1954 some 420 or more groves have been inspected by the Citrus Experiment Station and the State Plant Board. Of these, the burrowing nematode has been found in 325 groves. Some of these groves had to be sampled three or four times before the burrowing nematode was found, particularly where the old method of recovery was used. There are some groves that at a single inspection appear to have Spreading Decline, in which the burrowing nematode has not been found even with as many as eight and ten different samplings, but it should be borne in mind that such

groves have not been mapped to determine that there is actual spread and some other cause is probably involved.

There are eighteen counties in which one or more groves have been checked for the burrowing nematode. These are:

Brevard, DeSoto, Highlands, Indian Riven, Manatee, Orange, Pasoc, Polk, Sarasota, Citrus, Hardee, Hillsborough, Lake, Marion, Osceola, Pinellas, St. Lucie, Seminole.

The disrtibution of the 325 groves infested with the burrowing nematode by counties is as follows: Highlands 22, Hillsborough 4, Lake 6, Orange 13, Pinellas 1, and Polk 279.

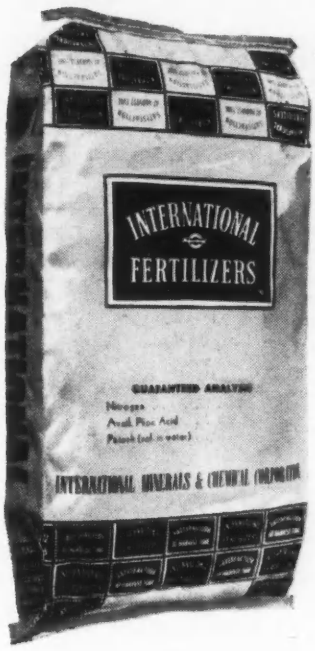
Nurseries, both citrus and ornamental, are being inspected for the burrowing nematode. Up to October 1, 1954, 247 nurseries have been inspected and 35 of these were found to have the burrowing nematode and are in quarantine. Three of these nurseries are in Highlands County, all of the others are in Polk County.

A cursory study based on the more complete grove maps and on first hand observation of 181 infested groves indicates the following: infested nursery stock was the source of the nematode in 47 groves; home site ornaments were responsible for Spreading Decline in 41 groves; spread from adjoining groves in 75 cases, and 18 groves were infested from other causes. In the 325 groves in which the burrowing nematode has been found, there is approximately 3000 acres of decline trees.

The original source of the burrowing nematode in Florida is unknown. Some nurseries became infested apparently by importations of infested tropical ornamental plants. These infested plants in turn passed directly to the home owner or to other nurseries. One of the difficulties in connection with ornamentals is that in most cases the ornamentals show no symptoms of the burrowing nematode such as does citrus. Housewives and garden clubs exchanging plants, along with other means of plant exchange and distribution, has played a far larger role in the spread of the burrowing nematode than has its own biological activity.

It would appear at the present time that surveying the extent of the burrowing nematode distribution is a much larger problem than at first appeared. This is due in large measure to the entrance of the ornamentals into the picture. It would seem that a general systematic survey will have to be undertaken in order to arrive

(Continued on page 22)



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The Experimental Basis And Limitations Of The Pull-And-Treat Method Of Handling Spreading Decline

R. F. SUIT

FLORIDA CITRUS EXPERIMENT STATION, LAKE ALREFD

As the number of groves affected by Spreading Decline has increased, many growers have wanted to do something if possible to get the land back in production. Pulling affected trees and replanting with new trees without any type of soil treatment was not feasible since the new trees were immediately affected with the disease, no rootstock that was resistant being available. As far back as 1945 experiments had been undertaken with soil treatments following the pulling of the trees and from the results of these experiments it has been suggested that those who wish to take some positive action to either get back into production or to stop the spread of a spot of Decline, pull the trees affected plus a margin of healthy trees, treat the soil with D-D and after a suitable interval replant. This has not been recommended as a permanent solution to the problem but as a procedure of a temporary nature that is useful until something better is developed. The basis for this so-called "Pull and Treat" method will be discussed here and its limitations laid down. Lacking at the present time either a chemical treatment which can be applied to the trees in place or a resistant rootstock, it is the best procedure available even though it has some very definite limitations.

The work on which the "pull and treat" method is based really goes back to experiments started in 1947 and 1948 although the cause of the trouble was not established until 1953 (2). At this earlier time experiments in the field were started on the theory that the cause was either a nemotode or a soil fungus and that treating the soil with a compound which would have a killing action on either fungi or nematodes might have a beneficial effect. In 1947 some experiments were started with D-D and some other compounds in an attempt to treat trees in place, but it was found that the compounds were too toxic to the trees and a large number of trees were killed with treatments which might be con-

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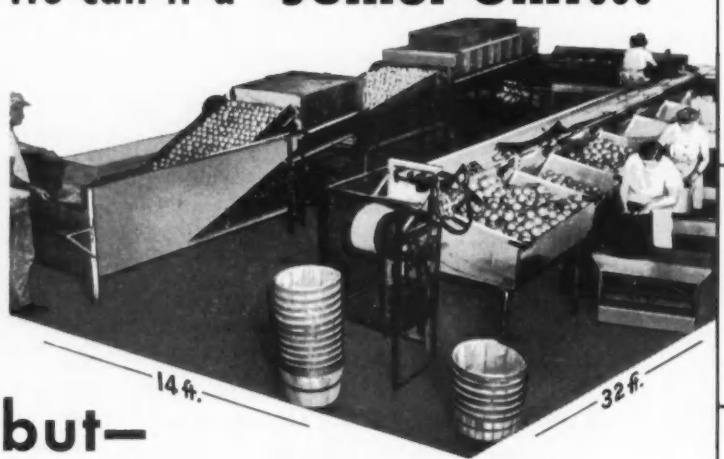

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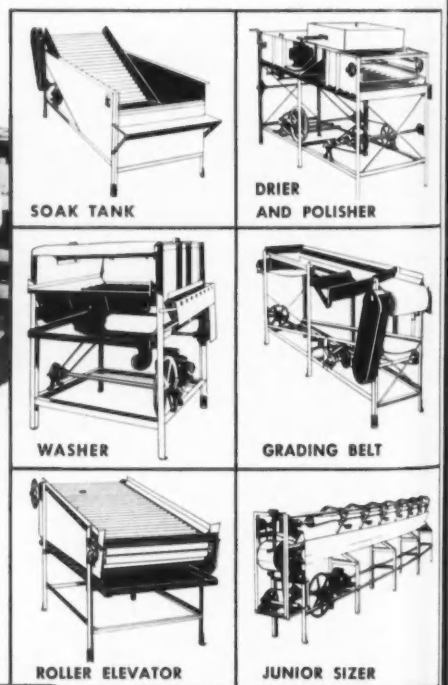

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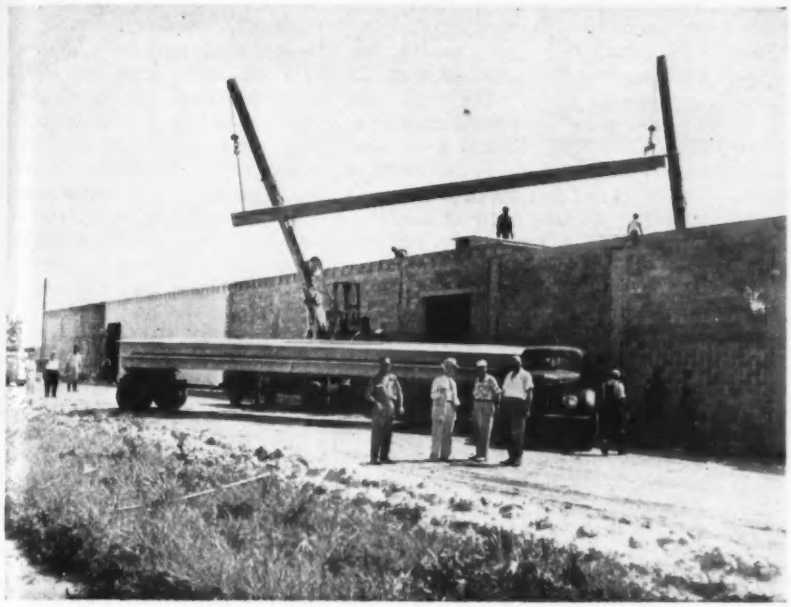

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sidered so dilute as to be marginal in toxicity as far as nematodes were concerned. This led to the development of some experiments in 1948 in which the trees were removed prior to treatment and the treated area was then replanted. In these experiments plots were used which were surrounded by infested soil so that both the effect of the treatment on whatever organism was causing the trouble could be determined and also the rate of re-entry in case the latter occurred. Of the various things tried the only treatment which showed promise was D-D and the subsequent discussion will be limited to this compound. Using a three-acre and a five-acre plot, both surrounded by decline, the old decline trees were pulled and the soil treated with D-D at 40 gallons per acre, the treatments being applied February 19 and 20, 1948. The three-acre plot was replanted in April and the five-acre plot in June along with suitable similar untreated areas for a check. The trees in the centers of the two treated plots are still free of the burrowing nematode, **Radopholus similis** (Cobb) Thorne, and are considerably larger by all measurements than the trees in the check plot indicating that a very excellent kill of nematodes had been obtained. After three years over half the trees in the first rows in the treated plots were showing decline (the burrowing nematode was not discovered until later and determination had to be by top root symptoms) and after 5 years trees in the second row were also showing decline and as of now, 1954, trees in the third row are showing decline. The nematodes are of course much deeper in the plots but time has not permitted a thorough survey though spot checking indicates that the fifth row may be free yet.

These experiments indicate two things of value: first, that the soil treatment prior to replanting has a favorable effect and, second, that a border of healthy tres or apparently healthy trees must be pulled in order to prevent reinfection of the treated plot. The latter need was indicated by 1950 and work started to determine to what extent infection existed beyond the visible border of the decline area. Since the nematode had not entered the picture and the cause was unknown, some indirect method had to be developed to establish the extent of the border that was involved within the healthy appearing trees. This need for an advanced border was also indicated in a number of cases in which growers had pulled visible infected trees only to have the trouble continue to spread.

In 1950, Ford (4) studied the physiology of the affected trees as compared to the healthy trees and was able to show that there was a definite variation in the respiration rate of root tips and in the catalase activity of leaf samples from apparently healthy trees at different distances in advance of the visibly affected area. His findings indicated that the first two apparently healthy trees were infected and occasionally the third tree so that the border of apparently healthy trees to be pulled in order to get beyond the infection would have to be at least four trees. Since the visible border vacillates a little with moisture conditions, it was important that the mapping of this border be done where there were maximum symptoms, i.e., when the trees were suffering for lack of moisture.

Since growers wanted to pull trees to eliminate a decline spot objected strongly to pulling four apparently healthy trees around the spot, the situation should probably be analyzed more closely. It should be remembered that the spot expands at an average rate of 1.5 trees per year so that the four apparently healthy trees do not represent healthy trees of indefinite life. Normally the first row and half of the second row of apparently healthy trees will be lost the first year, the other half of the second row plus the third row will be lost the second year, and the fourth row plus some of the fifth row the third year. This is to say that the average economic life of the four apparently healthy trees will be no more than two years and many in some instances be less. This is pointed up in an analysis made of eight groves which were under observation in 1945 and which contained 542 infested trees. To attempt to control the disease by pulling the visible affected trees plus four apparently healthy trees would have required the pulling of 1388 trees. However, by 1950, five years later, the maps showed that whereas pulling a four-tree border in 1945 would have taken 846 apparently healthy trees, that by 1950, 1389 trees which were apparently healthy in 1945 had succumbed to the decline, or considerably more than the original number in question.

With the above in mind, experiments were started in 1951 and 1952 with 18 decline areas totaling 104 acres. In all cases the visibly affected trees were pulled plus a border of four apparently healthy trees as determined by observation and the soil treated with 40 gallons per acre of D-D and the areas replanted after a suitable interval. To date, the trees replanted in the treated soil have remained free of the burrowing nematode as indicated by random sampling in the different areas. However, in three groves **R. similis** was found on some of the mature trees at the edge of the pulled area. This indicates that a sufficient number of trees to circumscribe the infested area were not removed. In the other 15 groves, the decline has not been observed and the replants are making satisfactory growth.

Additional areas of Spreading Decline were pulled and treated in 1953 and 1954 using the same technique. By this time, the burrowing nematode had been identified and in view of the depth in the soil to which it was found (3) and considering the recent results from California experiments on soil fumigation prior to replanting (1), the dosage of D-D was increased to 60 gallons per acre injected at a depth of 12 inches. This change was made in the spring of 1953 and pull-and-treat experiments since that time have used this rate of application. With this dosage, it is advisable to wait two or three months, or even later before the treated area is replanted.

The depth to which the nematode penetrates the soil is important since **R. similis** has been found in the 10 to 12-foot zone. In one experiment, D-D was applied at 50 gallons per acre. Two weeks later, D-D was detected at a depth of six feet, below which the soil was waterlogged with the water table at 6.5 feet. Nematode samples taken one month after treatment showed that no nematodes were present to this depth. It would appear that with a deep sandy soil, the D-D at a dosage of 60 gallons per acre should penetrate to a depth of at least 8 to 10 feet.

On the basis of the above experiments and in view of the fact that many growers wanted to do something immediately in advance of a final solution to the problem, the pull-and-treat method was suggested as the most feasible method of handling the situation based on the known information. This procedure would make it possible to replant the affected areas and, if properly done to eliminate the spread of the spot, and thus save the rest of the grove. The first step in such a procedure is the preparation of an accurate map as a guide

for the pulling. This requires skilled personnel if the work is to be properly done and at this point the Plant Board was able to obtain emergency money to undertake some of the mapping and identification work for those who wished to do something. Preparation of the maps by visual observation is not too satisfactory since the visible border is likely to vary with moisture conditions as previously mentioned, and actual identification of the border now depends upon nematode sampling. The importance of this is demonstrated in the following case: a Decline grove was thoroughly studied in January following a long period of favorable weather as far as moisture conditions were concerned. Starting from the visible margin at that time, the burrowing nematode was found two trees to the west, 10 trees to the north, six trees to the east and five trees to the south of the visible border of the Decline area. Obviously, a four-tree border of apparently healthy trees would have been much too narrow. This same grove was restudied in March following dry weather and the visible margin and the burrowing nematode findings were in substantial agreement so that a 4-tree border based on that map would have been ample. This sort of variation occurs because trees with partially damaged root systems can recover to some extent under favorable moisture conditions. All mapping is now done by actual nematode sampling in order to eliminate the possible error which might occur in an unusual case such as has just been outlined. In view of the rapidity with which the nematode may spread in a grove, it is suggested that any map used for tree removal should be made within a month of the time the trees are to be pulled. Once a grove has been mapped for tree removal, samples should be taken at intervals around the margin between the third and fourth tree ahead of the Decline area for nematode examination. If **R. similis** is found, a sample should then be taken between the fourth and fifth tree at that location and if the nematode is still found subsequent samples tree by tree should be taken until the nematode is no longer found. The line for tree removal is then drawn two trees beyond the last positive location of **R. similis.** This procedure will reduce the possibility of recurrence along the margin of the area. The trees are pulled and burned in accordance with the map and D-D is applied at 60 gallons per acre in-

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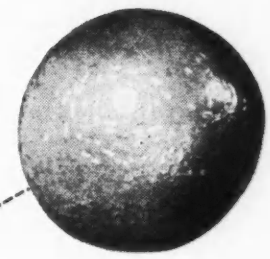

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jected at a depth of at least 12 inches.

The area can not be immediately replanted due to the presence of D-D in the soil. It has been found desirable to wait for two to three months following the application before replanting. The old trees along the border should be resampled for burrowing nematcde 6 months and a year later to make certain that no infestation has been missed in setting up the border.

In contrast to the recommendations here, vegetable growers usually use 20 gallons of D-D per acre injected to a depth of 6 inches. It should be pointed out that they are only trying to control their nematodes within a relatively shallow zone sufficient for the production of a single crop or at most two or three crops of relatively short growing cycle and with shallow root systems as compared to citrus. In this case we are attempting, if possible, to eradicate the nematode from the treated area. It is perhaps too early to tell whether we are accomplishing this with the treatment introduced but the indications are that we are successful. This may be due in part to the fact that we are apparently dealing with a nematode which must have living roots to live and reproduce. Citrus roots and the roots of some other plants will live for a long time in untreated soil but D-D is a very effective root killer and the treatment may in some measure be effective because of the foot killing which leaves the nematode to starve. Whatever the cause, so far at least, the young trees planted in treated soil appear to be free of the nematodes, and the chance of stopping the spread of the spot appears to be good if the work is properly done.

There are certain obvious limitations involved in this type of treatment which will be discussed at this point. The first of these is that no resistant rootstock is as yet available and reinfestation is possible. With what we know today, this hazard can be reduced somewhat by avoiding the introduction of infested nursery stock and the cleaning of implements used in the grove, though the latter have not been shown as yet to carry the disease. The pulling of trees, treating and replanting while adjacent infested ornamentals are left to start the infestation over represents an imposible situation unless the ornamentals are also cleaned up and the same is true of groves which have adjacent infested groves from which the nematodes may spread into the treated area. This hazard of reinfestation is going to continue until either a resistant rootstock or a suitable treatment for trees in place is discovered.

The second limitation is the cost of the procedure which is high and in the case of a small grove with the majority of trees infested represents a considerable capital outlay whereas a grove having a small precentage of the trees infested may be taken care of out of the profits on the good trees while at the same time preserving them from the spread of the infested area.

In order to meet the problems involved in large areas or in the protection of groves from adjacent infested areas, barriers may have to be resorted to. Work along this line was started about 1949 using formaldehyde and carbon bisulfide. These were narrow barriers, 4 to 6 feet wide, and tpplied without tree removal but did not prove successful in stopping the spread. Subsequent attempts have been started using D-D at high dosages and with much wider barriers which would require the pulling of a row of trees and hese show much more promise. These have not gone long enough for the results to be known but they give indications of success. For those wishing to try such barrier, the following suggestions are made based on our experience.

Pull a row of trees well in advance of the affected area and the burrowing nematode and treat the strip of land with D-D at the rate of 100 gallons per acre. Strips 8 or 12 feet wide could be treated down a middle without tree removal. In the first case, it is probable that the barrier should be treated each year, while he narrower barriers treatment should be made every six months, until better recommendations can be developed based on experiments now in progress. The same type of barrier may be applied to protect uninfested groves adjacent to groves having infested areas that may soon spread to the healthy grove.

Extensive experiments are in progress along this line using not only D-D but a large number of other chemicals and combinations of chemicals. Since all of these barriers have been placed well ahead of the infested areas it will be some time before precise information is available. Such barriers may prove a very valuable weapon in the grove protection and the work is being pushed and already about 2 miles of experimental barrier have been laid down. Results from these will be made available as they develop.

In conclusion, we want to reiterate that the pull-and-treat method is not offered as a final solution or recommendation, but the best suggestion we have today for getting unprofitable Decline areas back into production and to protect the remainder of the grove from the spread of the nematode from the infested area, with the latter being its most important function.

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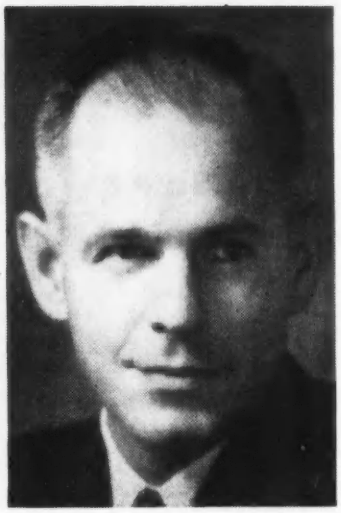
Experiment Station Research With Citrus In Indian River Section

The opportunity of discussing what the Agricultural Experiment Stations are doing in the way of research for the Indian River citrus industry is one which I appreciate very much. The development of this program over many years would make a very interesting story. It has had far reaching significance to all of you who are in the citrus business today. I will not take time to remind you of a long list of findings which you are now using one way or another in your daily operations. Many of these practices have become so routine that their source has long since been forgotten. They run the gamut from rootstocks to fertilizers, insecticides, fungicides, soil and water relationships, fruit maturity factors, packinghouse operations, and all the way through the marketing channels to the ultimate consumer. True, many practices developed years ago have since been replaced with better ones, but each new development has been based on previous ones, and all down through the history of our unique Florida citrus industry, the contributions of the Station have played a vital role in its growth, development, and its protection.

Let me say at the outset that we of the staff are keenly aware of the fact that more problems exist than we are able to tackle effectively. The problem of selection of projects constitutes the major policy consideration in public research administration. It is not one alone of finances and budgets, but I would not minimize the importance of these factors. If I were to ask one of you how much it cost you to produce a box of valencia oranges, you could give me a fairly sound figure.

Cannot Forcast

When a legislator asks me two or three years in advance how much it will cost in dollars, or how many and what kind of staff members, how much laboratory equipment, what kind of buildings, or how many trucks, typewriters, or how much travel expense will be involved in solving the problem of spreading decline, it is rather difficult to give him a specific answer. We deal primarily with the unknown. That's our business, to learn things that haven't been known before. And after we learn them we have to learn how they can be applied



WILLARD M. FIFIELD, DIRECTOR
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effectively and economically to a great many different situations.

I would point out to those of you who may feel that most of the Station research underway for the benefit of the Indian River citrus area is limited to that at our laboratory at Ft. Pierce, that you are not familiar with the entire story. Nor is it all limited to the Citrus Station at Lake Alfred, which has jurisdiction of the citrus work at Ft. Pierce. The work in marketing carried out by our Department of Agricultural Economics has yielded some very real contributions. Other departments at the Main Station, and other branch stations, have developed basic information useful to the citrus growers of this area.

For this paper, however, I have been asked to dwell primarily on the production research applicable to this area, and so the balance of my remarks will be confined to this subject.

Prior To 1947

Prior to 1947 research workers from the Citrus Experiment Station at Lake Alfred had conducted experiments in East Coast groves for a number of years on various problems peculiar to the India nRiver areas. In November 1947 a 30-acre citrus grove, buildings and adjacent unplanted land, known as the St. Lucie County Grove, was turned over to the Citrus Experiment Station for research purposes. This permitted a great deal of expansion of East Coast citrus research. Later the County Grove was incorporated into the research facility now known as the Indian River Field Lobaratory. Since that time the buildings have been renovated and more completely equipped, facilities for providing irrigation and controlling drainage have been greatly improved, and new experimental groves have been planted on previously unused land. Two citrus research workers have been stationed at the Indian River Lobaratory and several other research men from the Lake Alfred Station frequently conduct experimental work in the Indian River area.

One of the early projects was to analyze and describe the many types of soils on which citrus is grown in East Coast areas. In the old grove at the local Laboratory, for example, several soil types occur within this one grove and include both acid and alkaline soils. This information was included in Experiment Station bulletin 448, entitled "Chemical Studies on Soils from Florida Citrus Groves."

Another study carried on for the past twelve years is an annual sampling of over 100 wells in various East Coast counties to determine salt content of the water. As rainfall and need for irrigation has varied the wells have shown more or less salt from year to year, but fortunately no definite trend has been indicated in the twelve years to indicate that the water is becoming too salty over the area as a whole. This is something that needs watching because certain areas could get into trouble rather quickly if the wells went bad.

Water Problems

One of the most serious problems in the Coastal areas, and one that is minor in the citrus areas of the Ridge, is that of water damage to roots resulting from a high and fluctuating water table. The East Coast area has always been plagued with large numbers of declining citrus trees. In practically all cases the decline can be attributed in some way to water damage. It is true that other

causes of decline also are prevalent, but with water damaged roots the tree has little chance of tolerating the other factors. Growers may think they have well drained groves, but studies made in some of the better drained groves have shown that the water table can vary from two to six feet within a single season. When the water table gets up to three feet or even higher and remains for a few days, the roots rot off at that point and the tree is left with a shallow and insufficient root system to withstand subsequent droughts; thus irrigation is necessary. Complications arise with these weakened trees. Hurricanes loosen the roots and damage them severely and the weakened trees then develop dead branches which harbor the melanose spores and make this disease much worse. Melanose is particularly important in an area which ships much of its fruit in the fresh form.

However, the situation is not all bad. For example, surveys by the Experiment Station and State Plant Board have as yet failed to find a single case of the spreading decline disease on citrus in East Coast counties. This is the decline caused by the recently discovered burrowing nematode, which is causing so much concern in the interior citrus areas. And with trees that have restricted root systems, the Station has found that urea sprays as well as soil applications offer a means of feeding the trees the nitrogen they need to regain growth and set crops. Our men have found that there is a difference among these urea sprays in that some cause a yellowing of the leaves due to biuret in the urea as an impurity.

Iron deficiency has long been a problem in the alkaline area of the East Coast. While the Citrus Station discovered two years ago that iron chelates can remedy iron deficiency with resultant benefits to the tree in groves on acid soils, it has only been recently that they have found a chelate that shows promise of being effective on alkaline soil groves.

Pest Control

Pest control has always been a problem in citrus production, and it accounts for at least a third of the cost of production. Back in 1948 growers on the East Coast generally were getting very poor insect control, particularly of scale. Station men looked into this situation and recommended better mixing procedures for the spray chemicals and a different type of spray gun. This information disseminated largely through county agents, grower contacts and grower meetings resulted in a great improvement in pest control. Insect problems and populations vary from year to year, and also new materials for controlling these pest become available at frequent intervals. We realize that East Coast insect problems can be and often are quite different than those prevalent in interior areas. Thus it has always been a policy for the Indian River Laboratory to conduct pest control tests in East Coast groves. Results of these tests, when confirmed by more than one season's experiments, are incorporated in the annual spray schedule for the state.

Much the same can be said for fertilizer programs. East Coast trees being on different soils, on different rootstocks, and growing under different conditions often require specialized fertilization. Citrus nutrition experiments have been under way for many years in Indian River groves, and as new information of practical value is obtained it is included in published recommendations for fertilizers and nutritional sprays.

Samples of fruit have also been taken from these various experimental plots to Lake Alfred for

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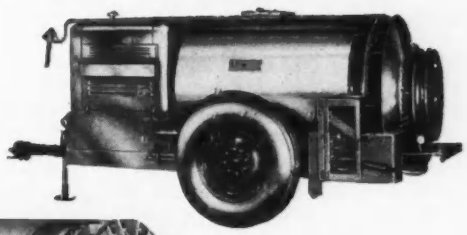

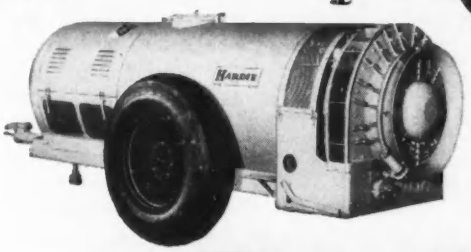

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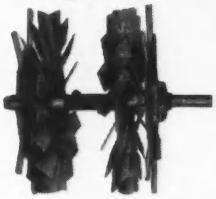

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evaluation in the concentrate field. This information is made available to processors buying fruit in the Indian River section and makes use of the fine facilities that have taken years to develop at Lake Alfred.

Tristeza

As you know, tristeza, which is particularly destructive to groves on sour orange root, was discovered in Florida two years ago. Sour orange is widely used as a rootstock on the East Coast and very likely many of these trees will eventually succumb to the disease. Fortunately we know quite a bit about this disease from our cooperative research in South America. Intensive studies and surveys made since the disease was found in Florida indicate that tristeza does not spread rapidly here, and a gradual change over can be made to tolerant rootstocks. Research has been in progress for several years at the Indian River Laboratory toward selecting tristeza tolerant stocks that are also tolerant of the wet soil conditions common in this area.

Many other phases of research, including those on cover crops, fungicides and herbicides, are being investigated at the Laboratory.

Another Experiment Station function of direct service to this area is the continuous state-wide survey of citrus grove conditions. Since October 1950, Mr. Holtsberg, a trained observer who works out of Ft. Pierce, has systematically examined 27 representative groves up and down the East Coast. He examines each grove each month for 27 insect pests, 13 parasites and predators, 23 diseases, symptoms and injuries; and 10 cultural practices and conditions. The records are analyzed at Lake Alfred and the important conditions and recommendations made known to county agents and production managers in the form of weekly newsletters and monthly magazine articles.

Research

It is important to emphasize again that research in the Indian River area is not confined to the staff members stationed at Ft. Pierce. Dr. Herman Reitz, who has general direction of this work, has his laboratory at Lake Alfred where he can take advantage of the extensive equipment accumulated over the years and where he can keep in contact with the developments coming from the very extensive research carried on there. As new developments occur, he can either have their application to East Coast problems studied by the men on the ground, or by himself, or he may choose to set up cooperative work using other staff members from Lake Alfred. The latter method is frequently used when the problem is very specialized and men especially trained in the particular field are needed. Such has been the case with the chelate problem, and where Doctors Stewart, Leonard and Kuykendall have carried on the experiments rather than attempting to develop entirely new men, a job which might require at least a year or two of training.

In the case of the pest survey and forecasts, one of the territories is the Indian River district, but Mr. Holtsberg, while cooperating with Dr. Reitz and the other men, forwards his data to Dr. Pratt at Lake Alfred so that it can be put through the complicated analysis that has been worked out for such data.

Greater Needs

This whole discussion points up the fact that most of the easy problems have been solved. Many of those which remain are extremely complicated and need for their solution not only a lot of expensive equipment but also men who have been trained in specific disciplines and who have worked for a period long enough to develop techniques and knowledge sufficient to handle the problem. Once the path for the application of the solution is laid, it is more economical to use the man and equipment already available than to employ additional men and duplicate the expensive equipment at other locations. In other cases, where, for example, staff members of the Indian River Laboratory are already trained in the subject matter, they work on the problem directly. The net result is that research is carried out on a much larger scale than the size of the staff would indicate.

Even if I had never been asked why we are not doing more research for your industry and for this area, I would know that such a question existed. It exists with practically all of our other many and diverse agricultural enterprises, and in all other sections of the state. Why should this area be an exception?

There are several reasons why we aren't doing more, and as I said before, there is more involved than budgets. One important reason stems from the fact that many folks expect a great deal from research people than research itself. There are those who feel that if a man dosen't drop in to see them every once in a while, they think he isn't doing anything. If the thousands of letters that come to our desks every month aren't answered promptly, the impression is that our people are just loafing on the job. One of the worst problems, frankly, are the many requests which come to our people to appear on programs of various kinds all over the state. Time is involved not only in travel, but in hours of preparation. We are constantly attempting to alleviate this situation in cooperation with the Agricultural Extension Service, and with the many societies, trade associations and other organizations. Granted that these things are part of our job, and we realize they are; nevertheless it requires more time than the average person realizes —time which otherwise could be spent on research.

In spite of all these and other problems, I feel that the men who have been trying so diligently to do the job you want done, have been and still are doing a fine job. You may be sure that your confidence and your splendid support are deeply and fully appreciated.

Notes Of The Trade

ACKNOWLEDGED WITH THANKS

The editorial force of The Citrus Industry acknowledges with appreciation and thanks the receipt of a liberal Christmas shipment of fine Florida oranges from Mr. Donald J. Nicholson, proprietor of Royal Purple Citrus Research Nursery at Orlando. Mr. Nicholson emphasizes that his is not a commercial nursery but is devoted to citrus research and the development of new varieties of citrus fruits.

Among the several varieties in his gift packages were oranges from trees developed in his Research Nursery during a period extending back for several decades. There were Dream Navels, Nicholson's Navel, the Barker Navel and the Midget Honey Orange.

To say that this Christmas gift of such fine fruits was enjoyed by the members of the editorial staff is a base understatement. We are thoroughly convinced that Mr. Nicholson knows his oranges and has developed some rare and deliciously flavored varieties.

Elsewhere in this issue Mr. Nicholson tells something of his work at his Research Nursery in the development of new types of citrus fruits.

OBSERVATIONS ON THE BIOLOGY OF THE CITRUS TREE SNAIL

(Continued from page 9)

the base of the tree and then covered with a loose mat of leaves and organic material.

When infesting a citrus grove with snails it does not appear necessary to infest each individual tree. Some studies have been made on the migration of the citrus tree snail and the following facts would seem pertinent to any attempt toward infestation. Snails have been found to move from an infested to a noninfested section of a grove at the rate of 3½ to 4 trees per year. Marked snails have also been shown to move 2 or 3 trees away from the tree in which they occurred when marked. Thus, it would appear that snails placed on each sixth to seventh tree in a grove could be expected to spread throughout the grove in one season's time. No information is available as yet on the number of snails that should be used to infest each individual tree. In the case of hibernating snails, 10 to 25 per tree have been used. When using eggs, 40 or 50 have been placed under each tree.

Soil Cultivation.—Little information is available as yet concerning the effect of chopping, discing or mowing on the snail population. It is probable, however, that any of the three operations can be utilized during the hibernation period. At that time few snails would be killed, either by actual mechanical injury or through dessication.

Grove Fertilization.—Little information is available as yet on the effect of the various components of fertilizers on citrus tree snails. In laboratory tests the nitrogen element of commercial fertilizers has a toxic effect on the snails. Snails coming into contact with any chemical containing nitrogen immediately withdraw into the shell and die.

Laboratory test on materials used for spray application of nutrients on citrus trees have indicated that both zinc and copper are repellent to the snails as they will not feed on leaves that have been dipped or sprayed with zinc or copper compounds. In the case of boron or manganese there is apparently no toxic effect as the snails feed on foliage covered with these materials quite readily and survive. In the case of arsenic the snails are not repelled, feed readily on the foliage, but soon die of arsenic poisoning.

It is believed that copper in a soil application may have the same effect as it does on spray application. For this reason it would not behoove the owner of a snail grove to distribute a cooper or nitrogen bearing fertilizer to the bases of the trees during the summer application.

Insect and Mite Control Practices.—No research data are available on the toxic effect of various insecticides on snails. However, many groves have been observed and it has been found that sulfur, lime-sulfur and to a limited extent oil are successfully used on citrus groves infested with the citrus tree snail. No information is available on other insecticides such as DN or parathion.

Processing Of Southern Food Crops Can Be Improved

How progress is being made in solving some important food-processing problems of the South can be told from a listing of up-to-date developments in research underway by U. S. Department of Agriculture's Southern Utilization Research Branch, Agricultural Research Service.

Programs are in progress on citrus fruits, cucumbers, sweetpotatoes, beets, tomatoes, black-eyed peas, rice, vegetable oils and fats, and sugarcane.

Work is conducted at the Southern Regional Research Laboratory, New Orleans, and at 4 field stations: Citrus Products Laboratory, Winter Haven, Florida; Fruit and Vegetable Products Laboratory, Weslaco Texas; Food Fermentation Laboratory, Raleigh, North Carolina; Sugarcane Products Laboratory, Houma, Louisiana. Much of the work is being done cooperatively with other research organizations in the South.

C. H. Fisher, Chief of the Southern Branch, and R. M. Persell reported the developments in the 1954 Annual Review Number of the **Southern Food Processor.**

Research has produced answers to some questions concerning effects of heat treatments on the quality of orange juice being processed into concentrates. **Delicious new superconcentrated limeade bases** have been developed, less costly to ship and store than others. **Promising methods,** still at laboratory stage, **have been developed for canning red and pink grapefruit** so that color is retained.

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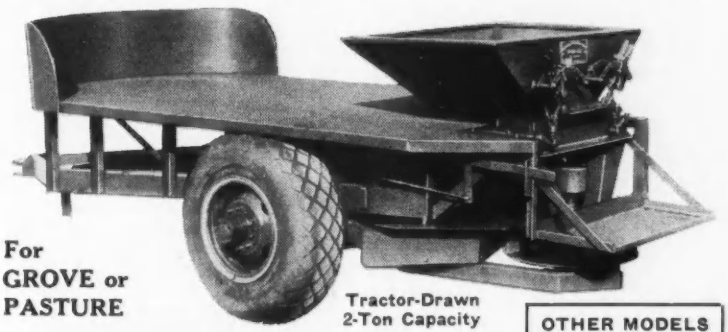

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CITRUS INSECT CONTROL FOR JANUARY, 1955 . . .

(Continued from page 3)

thorough application on the limbs and trunks of the trees. An oil spray will reduce the mealybug population but is not as effective as parathion.

Mite Control: Purple mite infestations should be kept at a low level during January and February to prevent leaf drop. Effective miticides include DN Dry Mix, aramite, and ovex. DN Dry Mix should not be used after new growth has appeared. Oil sprays are also very effective but the limitations are the same as where it is applied for scale control.

Six-spotted mites can be controlled with the same materials that are used for the control of purple mites. In addition lime-sulfur at 2 gallons per 100 may also be used. Although lime-sulfur is effective, it is not as effective as the miticides used for purple mite control. Complete coverage of the under surface of the leaves is necessary for satisfactory six-spotted mite control.

Rust mite infestations are most effectively controlled with a combination of 1 gallon of lime-sulfur plus 5 pounds of wettable sulfur per 100 gallons. During the winter time lime-sulfur can be safely used up to 2 gallons per 100, but for rust mite control alone this is usually not necessary. If either DN or aramite is to be used for purple mite control, then lime-sulfur should not be used, because these materials are not compatible with it. However ovex can be used with lime-sulfur. Other materials that can be combined with lime-sulfur include the different compounds of zinc, borax, and manganese. During cold weather wettable sulfur is not as effective as lime-sulfur but if a thorough application is made, satisfactory control of rust mite may be obtained. All of the miticides and the nutritional elements are compatible with wettable sulfur. Sulfur dust is much less effective during cold weather than sulfur sprays.

Scab is controlled with a dormant copper spray used at the equivalent of 0.75 pounds of actual copper per 100 gallons. Where scab is severe that amount should be doubled for the first application. It is important to apply this spray before any new growth appears.

For more detailed information, refer to the "Better Fruit Program", or consult the Citrus Experiment Station at Lake Alfred, or Fort Pierce.

Overtime Charges For Market Inspection

The U. S. Department of Agriculture has announced that, effective January 1, 1955, a charge of $1.50 per hour in addition to the regular carlot or hourly fees will be made for inspection of fresh fruits and vegetables in terminal markets on Saturdays, Sundays, holidays, or at other periods outside the regularly-scheduled work week of inspectors.

The additional charge will be assessed only if the applicant specifically requests that the inspection be performed during a day or period outside the regular work week. Otherwise, the inspector will exercise the option of performing the inspection at the regular rates or deferring it until the next work day.

This charge will apply to all applicants for such inspections including commercial firms, institutions and government agencies. It will be effective in all markets including those where the inspections are performed by collaborators under cooperative agreements between the Department and the respective States.

This revision does not apply to the Federal-State shipping point inspections for which the fees and charges are established by the States.

DISTRIBUTION OF BURROWING NEMATODE RADOPHOLUS SIMILIS IN FLORIDA

(Continued from page 11)

at an accurate analysis of the situation and that this survey will have to be statewide.

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The recommendations of the Florida Citrus Experiment Station at Lake Alfred, published in January 1954, stress the need for large application of magnesium for Citrus in soluble form and state that it is usually applied as a Sulphate.
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Grower's Own Page

Two Brand New Varieties of Oranges Discovered

On November 12, 1954, I discovered among some 100 of more experimental seedling orange trees which I had planted from selected seeds from a number of varieties of navels, and several hundred grown from seeds of "round" oranges, planted about 1938, one Navel Orange, Seedling tree which was carrying a tremendous crop of seedless fruits of most outstanding character for that of a navel variety, and one sweet seedling orange tree carrying a very heavy crop of fine-looking fruit, semi-seedless in character and of very early maturity

The navel seedling had first fruited in 1952, again in 1953, and this season, each year yielding more fruits. Fruits were entirely seedless, excellent shapes and sizes and of nice color. The fruits were extremely juicy, thin-skinned and of very fine flavor. These features coupled with the fact that the tree bears so very heavily seems to point to a new type of considerable importance. The fruit from this tree from the very first crop was found to be of excellent quality in all respects.

I might state that among other 30-odd different navel seedlings which I have produced and fruited, while some do approach the same fine flavor and quality oranges, none bear so heavily as this particular tree.

This experiment has also proven that over 95% of all seedling produced from seeds of navel oranges, reproduce seedless, naveled fruits. A few produce seedy fruits with or without the navel mark.

It now remains to be seen what rootstocks are best suited for this promising navel type. Very probably, sweet orange rootstock will perform admirably.

NEW ROUND TYPE ORANGE

This new type orange was also found on November 12, 1954, in my Oviedo grove. Two long rows of sweet seedlings had been planted and one of them proved outstanding early and of very fine early flavor; juicy and thin-skinned with few seeds. Sizes of the fruits average 176 to 200. Skins rather smooth, fruit round and symetrical, juice-color pale, skin-color bright yellow. The variety shows every evidence of heavy productivity judging from the initial crop.

Any layman or grower, if he has the desire, curiosity, patience, money and perserverance, can by spending 15 or 20 years, develop many other valuable new varieties of oranges, red or white grapefruit; new and

(Continued on page 28)

PARKER NAVEL ORANGE

First descovered fruiting November 12, 1954, at Oviedo, Florida. From seed of a Washington Navel planted by Donald J. Nicholson 1935 or 1936. An extremely heavy bearing and equal to round oranges for fruiting.

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Just the mention of the word lychee in almost any crowd will bring the question, "What in the world is a lychee?". Although the lychee is not new to Florida, it isn't too surprising that so few people have heard of this exotic, tropical fruit, for the commercial production of lychees in this country is still very much in its infancy.

Since it is always difficult to adequately describe a fruit to someone who has never seen it, I asked Hollie Popham of Palmer's Nursery in Sarasota to bring a sample of fruit for you to see and he was kind enough to do so.

The lychee is native to South China and for centuries has been a prized delicacy of Chinese Emperors and their subjects. Today this fruit is grown commercially in such widely separated countries as India, Japan, Brazil, Australia, Madagascar, some of the West Indies, Hawaii, Florida and South Africa.

In China lychee trees have been known to grow extremely large and produce prolifically for hundreds of years. Wen Hsun Chen says that one tree at Hinghwa, Fuchien province, China, is nearly 6 feet in diameter and 75 feet high. Some trees have been known to produce 1,000 pounds of fruit, but good-sized trees over 30 years old and well cared for should at least average 250 pounds of fruit per year. One 24 year old tree in Florida has produced 400 pounds of fruit and a 10 year old tree has topped 155 pounds.

It has been reported that the first lychee fruit in Florida was produced in Sanford in 1883. This being true it means that the trees were introduced and grown successfully in the state sometime during the 1870's.

Although some nurseries in the southern half of the state have been selling layered lychee plants since the beginning of the century there was little commercial interest in this crop until just before the end of World War II. Since the end of the war a number of orchard plantings have been made from Pinellas County on the West Coast, Merritt Island on the East Coast and the Lake, Orange, Seminole County area in the north central part of the state south to Dade County.

According to the latest tree count made last October – there were slightly less than 13,000 trees in commercial orchards in the state. This amounts to about 260 acres at 50 trees per acre. It should be pointed out that since the orchards are still quite young production costs are relatively high.

During 1953 members of the Florida Lychee Growers Association – which includes practically 100% of the present commercial producers-product something over 10,000 pounds of fruit. Of this, according to Gordon Palmer, secretary-treasurer of the association, 7,561 pounds were marketed through fruit brokers on the open market, 150 pounds were distributed as samples and another 300 pounds went to the University of Miami for research work.

Of the 7,561 pounds marketed, most of which was shipped by air freight they received an average price of $1.00 per pound FOB. A few pounds were shipped on a consignment basis and the total crop brought $6,996.04 or an average of 92.5 per pound to the growers. As production increases prices will surely decline.

The curent high prices place lychees out of all but specialty markets. Fortunately, the specialty market appears large enough to consume all the lychees that will be produced in Florida for several years to come.

Lychees have rather peculiar blooming habits. Individual flowers are produced in panicles. Each panicle, according to work by Mustard and Nelson of the University of Miami and Su-Ying Liu, University of Michigan, produces three types of flowers: Staminate or male, hermaphroditic functioning as female and hermaphroditic functioning as male. These three types of flowers appear consecutively on the same panicle. That is male flowers open first for the male cycle, female flowers open next followed by the second male cycle. Fortunately, for the sake of polination, the change between cycles is gradual and during the transition period male and female bloom appear on the same panicle at the same time thus allowing self fertilization to take place.

Lychee trees usually set exceptionally heavy crops of fruit, but usually only 10 per cent or less remains on the tree until maturity. There are several stages of droppage the first month following set. There are also some problems encountered in getting lychees to bloom regularly. Based on reports from important lychee-growing areas lychees apparently have a chilling requirement that must be met. In other words, for floral initiation the lychee apparently requires cool winters with temperatures above freezing, but below 40 degrees F. Groff states that periodic cold snaps in winter between 30 and 40 degrees seem to give lychees the physiological changes necessary for fruit bearing. Miss Margaret Jane Mustard at Miami University is now working on possible sprays that will shock the trees into bloom.

Now lets go into some of the major production factors involved in lychee growing. One of the first items to consider is climatic requirements. Most people consider lychees a tropical fruit, but actually it is subtropical in requirements. It seems to thrive best in regions of brief winters with little frost and long hot summers with high humidity.

It is the current concensus of opinion that in Florida the lychee is as cold hardy as the average round orange. A mature tree can, of course, withstand considerably more cold weather than young, immature trees. In China and India lychees are grown in areas where winter temperatures are much more severe than temperatures in Gainesville, Florida. However, the colder weather there is less erratic and the trees are better preconditioned to withstand cold temperatures.

In China fully dormant, mature trees have endured 11 degrees F. with little injury. When in this country Wen Hsun Chen reported that he has seen temperatures down to 9 degrees F. in lychee orchards in his native country with heavy snow on the grown. Although the trees were killed back several feet they were out of production for only two years and were not permanently damaged.

At Homestead mature trees, not in an active growing condition, have survived 28 degrees F. without notice-

able damage. Tender foliage, however, can be killed at 32 degrees.

High humidity is apparently a must for best lychee production. In the areas where lychees are native there is much fog in February and March and rain or cloudy weather is common during April and May. The lack of this type of weather in Florida during the spring might be responsible for the severe tip burn of leaves so common here. On the other hand, some research workers believe that leaf tip burn is a symptom of some nutritional deficiency. The exact cause of the trouble is as yet unknown.

Heavy rains during the blooming period are definitely harmful, yet ample rainfall during fruit development-from April through June--is essential. Where there is likelihood of drouths during that period supplemental irrigation is recommended.

Item 2 to consider before planting an orchard is spacing distances between trees. It should be remembered when planting that any portion of a mature lychee tree which does not have full exposure to sunlight will have its fruiting potential reduced considerably. Since in sandy, well-drained soils the tree grows to such large sizes it is recommended they be spaced at least 40 feet apart. Under best growing conditions 50-foot spacing is preferred.

Where trees are spaced 40 to 50 feet apart each way some growers plant a tree in the center of the square of each four trees. This helps increase production while the orchard is still young. As the orchard matures, using this center tree as a source of new planting material will keep it cut back and will give a source of plants for replacements and additional plantings. In case of overlapping the center tree should be removed.

In areas where hardpans or high water tables will limit the size of trees--as is true in many areas of the state--spacing of 30 to 35 feet are considered minimums.

As to fertilizations practices, this is an area of lychee production where considerable research is needed. Due to this lack of research we have no comparative data on which to base any recommendations. At this time I can only summarize some of the practices that are being followed by some of our more successful producers.

In the Dade County area Dr. Ledin reports that a fertilizer formula of 4-7-5-3 (MgO) has been used with success. In this formula 40 percent of the nigtrogen is from organic sources. Reports from the ridge section show that growers there are using the regular citrus fertilizer mixture with success. A typical formula includes 6-6-6-4 or 8-8-8-4 (MgO). In the sandy areas minor elements, such as manganese, zinc and iron are also included in the formula although research has not shown the need for these elements in all cases.

The fertilizer program I have outlined applied to bearing trees only. Trees less than a year old should have small amounts of fertilizer applied monthly. This can be extended to every other month as the trees get older and so on until the three-application-per--year schedule is obtained during the 5th or 6th year following planting.

The amount of fertilizer to apply will naturally depend on the size of the tree, age and rate of production. There is some indication that lychees demand slightly more fertilizer than citrus and therefore should receive higher amounts of plant food.

Fertilizer applications are usually made in late February or early March, again in May and again in July. This gives ample food during the fruit ripening and heavy growing periods.

(Continued on page 28)

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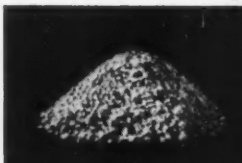

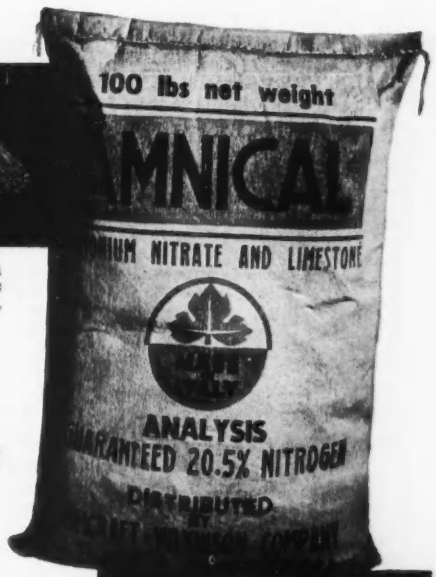

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Reports Of Our Field Men . . .

HIGHLANDS AND POLK

J. K. Enzor, Jr. & R. E. Lassiter, Jr.

The leaf drop referred to in this space last month which resembles purple mite defoliation with a very small infestation of purple mite is continuing. We have seen several cases of this in the last week or ten days. This type injury seems to be worse on sour orange root stock than it is on lemon. The weather in the first two weeks in December has been very conducive to this type injury and where this has occurred along with an infestation of purple mite, it has been very severe. The growers should continue to check their groves for both rust mite and purple mite even though the fruit may have been picked.

Both greasy spot and so-called "pink pitting" on fruit seems to be considerably less than last year. Again, as in the past, greasy spot is worse on Pink and Red grapefruit varieties.

Moisture conditions at this time are very good in this area.

The reduction by the USDA of the citrus estimate on December 10th was welcomed by most growers. However, up until this date, this reduction has not been reflected in the on-tree price for the growers' fruit. It is generally felt that the estimate, in order to be more nearly correct, will have to be reduced further.

We would like to take this opportunity to wish every-one a Merry Christmas and a Very Prosperous New Year.

EAST HILLSBOROUGH AND PASCO COUNTIES

E. A. McCartney

The Fall fertilizer application has been completed in this section as of December 15th. The groves are in good shape and should set a good crop next season, with normal weather prevailing. This observation is based on the quantity of new bud-wood put on this past Summer and the excellent condition of the trees. We have had fair fall rains in most of this territory which has helped size up the fruit.

One of my growers in Pasco County picked 4503 boxes of Hamlin Oranges from 417 trees, a small block on lemon root-stock 18 years old.

We are having some cold weather right now, however, there has been no damage to citrus except in a few low spots and then only to very young trees. Tender vegetables, squash, berries, eggplant, etc., were hard hit as were some pastures.

The mellon growers are active at this time fertilizing and will be planting by the time this reaches the publisher. There will be less acreage planted than last year.

Christmas will have passed when you receive this, so here is hoping you all had a wonderful time—and the best of good luck for 1955.

NORTH CENTRAL FLORIDA

V. E. Bourland

Weather has been cool and dry, some frost with light damage to grass and tender crops, but no fruit damage. Fruit is moving steady, but not so fast, market price on tree remains around $1.00.

Quite a few tangerines being picked, but mostly spot picking as size has been running small, the growers are expecting more fruit to be picked when all canning plants get in operation. Red spider and purple mite are still working, and keeping the growers busy controlling them. Most growers have about completed their fall application of fertilizer, groves in general look very good.

NORTH HILLSBOROUGH AND PINELLAS COUNTIES

J. A. Hoffman

Most growers have completed their fall application of fertilizer and cultivation and with plenty of rain during the past week groves are in excellent condition. Cool weather and several heavy frosts has hastened the ripening and coloring of fruit.

Heavy movement of fruit by processors and fresh fruit shippers is at its peak prior to the Christmas holidays.

Purple mite and rust mite have continued to plague the growers on the west coast. A constant check should be maintained and a dust or spray applied if leaf drop occurs.

Watermelon growers have been busy the past month turning the soil and laying off. Fertilizer is now being applied and a late December planting is expected. Many acres of melons are being planted throughout this section.

SOUTH POLK, HIGHLANDS, HARDEE AND DESOTO COUNTIES

C. R. Wingfield

The week before Christmas we experienced some low temperatures with heavy fros tin most of the area. There has been damage to tender vegetable crops in unprotected areas, however, no damage has been reported to citrus.

The movements of fruit is under that of last year to this date and there is hope that it will increase after the holidays. The cold weather has greatly improved the eating quality of the fruit.

Moisture conditions are good. It appears when we begin to need that rain we get it. In some sections a few weeks ago there was heavy rains that evidently started a fruit drop in mid-season fruit. This was soon over with open weather. The fall application of fertilizer is over with the exception of some who will wait until January.

May the New Year bring to all a Peaceful and Prosperous Year.

SOUTHWEST FLORIDA

Eaves Allison

Citrus prices are coasting along at this time kind of looking at the bottom. However, prospects are brighter for a later date when solids come up and the prospects of a smaller crop become more apparent.

Much fruit in this area would have brought more money if it had chalked up more eating quality. High analysis inorganic mixtures when used in this section go past our feed root systems like a pay train passing a tramp. Down here we don't have any tap roots and three feet is a real deep soil. Such a program may show less cost per box, but the result usually shows less profit per box also — so what good is it?

Year after year those good Lyons organic citrus mixtures wil lbring you the most profit — and the buyers will be looking for you instead of you looking for them!

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Uncle Bill Says:

I'm a purty friendly sort of a fellow most all the time but at this holiday season I'm jist plumb runnin' over with gratitude fer the many nice things folks have done fer me all through the year just ended, and I shore hope that everyone had jist the nicest Christmas they ever had . . . and right now I'm hopin' fer everyone that they have the Happiest and the Most Satisfying year in 1955 that they kin ever remember.

It's true I'm a year older'n I was at this time last year, but I don't feel any older . . . if there is any change at all in me it is an even keener appreciation fer the friends I've got . . . they ain't nothin' in all the world worth more to me than my friends, and while it might not take a very big book to write down the names all of them that can be classed as real shore 'nuf friends . . . still there is a heap of people who has been mighty nice to me throughout all these years . . . and believe me I appreciate these folks as well as that smaller group who are almost kissin' kin.

Sort of feels good to me to be able to take my mind off'n business affairs fer a little while and just sort of swell up with good thoughts about folks in general . . . I've got some faults, along with most other folks, but at this particular season I'm hopin' that folks will sort of fergit about my failin's . . . and in turn if we have any notions 'bout your peculiarities we're goin" to try to fergit 'em.

They is still plenty of troubles in the world but chances are that if everyone everywhere would carry the same sort of spirit in their hearts that is common to this season of the year they'd be a lot less troubles.

TWO BRAND NEW VARIETIES OF ORANGES DISCOVERED

(Continued from page 23)

interesting and possibly quite valuable hybrid fruits from seeds of Temple oranges and King oranges, both of which produce great variations among their seedlings. There lies a great future ahead for these who dare to dabble in plant-breeding, but one develops but very, very few valuable or improved types among thousands of such plants, however, always is the probablity a few trees will produce extraordinary fruits of great commercial value. One such new fruit is that of a temple seedling which fruits are quite different from that of a Temple orange. The new type seedling Temple fruits are indeed delicious and different.

Among seedlings produced from seeds of King oranges one can certainly expect to produce smooth-skinned, red fruits of a free-peeling character which are very much like Tangerines, only larger in size. Such fruits are very fine.

Extensive experiments should be made with King orange seedlings for developing types of tangerines which do not puff or dry. Select a lone King orange tree in a grove of mixed varieties for seed-plantings.

DONALD J. NICHOLSON.

Be Sure to Visit
THE CITRUS EXPOSITION
In Winter Haven, Jan. 15-22

LYCHEE PRODUCTION IN FLORIDA . . .

(Continued from page 25)

It seemes advisable to withhold fertilizers during late fall and early winter.

Some minor element deficiencies have shown up in lychee groves and on alkaline soils have been corrected with foliar applications of copper, zinc and manganese. The nutritional sprays include 2 pounds of copper sulfate, 2 pounds of manganese sulfate, 2 pounds of zinc sulfate plus 2 pounds of lime for neutralization.

Chelated iron--EDTA on acid soils and EEDTA on the more alkaline soils--have corrected iron cholorosis in groves suffering from this deficiency.

For many years the only method of propagating lychees has been by air layerage or marcottage. For best results this should be begun in the spring just as the tree begins an active flush of growth.

After an adequate root system has developed--this usually takes four to eight months--the branch should be removed by cutting it just below the rooted area. After removing the plastic wrapper, it should be potted in soil high in organic matter.

The pots should then be placed under a sprayer constant mist until well established and then hardened off gradually. When ready to plant in the field every care should be taken to prevent breaking tender roots in the transplanting process. Until firmly established in the field young trees should be protected fro drying winds. A partial shade prevent sun scalding is also desirab

Seed are seldom used for propaga ing because of the uncertainty of t resulting progeny. Seeds are ve short-lived, but germinate readily planted within several days aft taken from ripe fruit. Seedling a also slow coming into production--t time varying from about 5 to 25 yea

Workers at the Sub-Tropical E periment Station and Miami Universi have done some work on rootin lychee cuttings. They found that cuttings taken during Novembe December, January, February a

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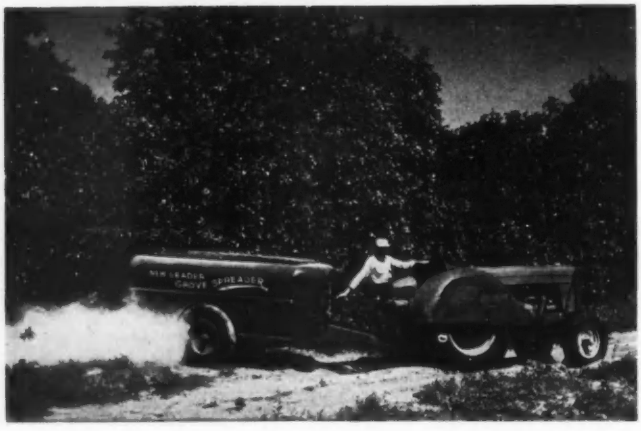

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March callused profusely but formed no roots. Flush cuttings, that is those taken in April and May while the trees were sending out flushes of new growth, rooted quite satisfactorily under constant mist.

Little success has been obtained in grafting or budding lychees primarily because only one-third of the cambium or living layer of the tree is active at any one time.

It is not unusual for layered trees to flower the first year after being set in the field, but it is usually best to remove any fruit set for the first or second year. Usually layered plants begin production in their fourth to fifth year.

To date the only variety of lychee being planted commercially in the state is the Brewster. This is the same or similar to the Chen Purple variety in China. The fruit normally ripens during June or early July. Unfortunately all fruits do not ripen at the same time and several pickings must be made.

Generally the whole fruiting panicle is broken off the tree during harvest. They are shipped in mango or avocado lugs, with about 10 pounds per lug. The lugs are then usually shipped by air freight to northern markets. Fruit thus picked and shipped will remain in good condition for seven to eight days. If kept in cold, dry storage they will last three to four weeks.

One advantage to lychees is their ability to be readily frozen in their natural state without processing. They will keep this way almost indefinitely.

These, then are some of the factors involved in lychee production in Florida. Since there is such a tremendous interest developing for this fruit in the state I'd like to make a few statements as to why I think the industry will grow and develop on a sound footing.

First—Although there is only limited acreages in the state that can be developed into lychee orchards, researchers will undoubtedly devise methods of developing lands now considered unproductive. Thus, acreage available for lychee production should increase.

Second—Lychees have definite eye appeal — an important item when competing on the market for the housewife's dollar. Taste appeal is another factor in the lychee's favor. Most people like this fruit the first ttime they try it.

Third—and this point is very important. Unlike most industries lychee growers have developed an association to assist them from the beginning in production and marketing problems. With this type of cooperation the industry should be ready for many of the problems which will come along.

Already the Florida Lychee Growers Association has made a contract with the Florida Citrus Exchange whereby that organization has agreed to market all of the lychees grown in the state. The Exchange has brokers already in the market, and valuable contacts, that will make their services of tremendous value to this fledgling industry.

Last, but not least, since frozen lychees will last almost indefinitely the marketing period can be extended over the entire year or held over even longer if market conditions warrant. In addition, this fruit can be preserved by canning in syrup, dried and marketed, and used in the making of wine, sauce, spiced, sweet pickled and preserved lychees. Researchers can surely find other uses for this highly nutritious food if the need arises.

Like any new industry there will be periods of ups and downs, but it seems to me lychee growing holds some promise in Florida's future agriculture.

Lake County's citrus crop has made rapid progress in coloring and sweetening during the cool weather of the past few weeks, according to County Agent R. E. Norris.

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USDA Buys 150,000 Cases Canned G'fruit Sections For Schools

The U. S. Department of Agriculture has announced the purchase of 150,000 cases of 24 No. 2 cans of U. S. Fancy grade grapefruit sections at an average price of $3.34 per case, f.o.b. shipping points, exclusive of cash discounts.

These canned grapefruit sections, all from Florida processors, will be delivered during the period December 20 through February 12 to schools participating in the National School Lunch Program.

On November 23 the Department announced the purchase of 251,200 cases of this product. The two purchases, totaling 401,200 cases, complete the purchase under purchase specifications mailed to grapfruit canners on November 12, 1954.

Intention to purchase canned grapefruit sections from the 1954-55 crop for use in the National School Lunch Program was also announced by the U. S. Department of Agriculture. Purchases will depend upon the quantity available for early delivery as well as total quantities and prices

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Short Mediterranean Crop Expected To Help Citrus Exports

A short Mediterranean citrus crop is expected to give United States oranges, lemon and tangerine exporters the best overseas market opportunity in recent years, according to a marketing study by U. S. Department of Agriculture representatives in the Mediterranean area.

There also is possibility of expansion of United States exports of concentrated orange juice and single-strength citrus juices as result of short fruit supplies in Spain, Italy and Israel.

The USDA study was conducted by J. Henry Burke, citrus marketing specialist of the Foreign Agricultural Service, assisted by Burl Stugard, U. S. agricultural attache at Madrid and Earl Fox, U. S. assistant agricultural attache at Rome.

USDA representatives have reported that the 1954-55 Mediterranean orange, lemon and tangerine crops will be the smallest in the last five years, with light crops in Italy, Spain and Israel being only partly offset by record North African production.

Total orange and tangerine production this season in the major European supplying areas (Spain, Italy, Israel and North Africa) is estimated at 70 million boxes compared to 88 million boxes from this area after the Spanish freeze last February. The current crop is about 18 million boxes smaller than last season's post-freeze estimated production and 13 million boxes less than the initial 1952-53 crop forecast.

Total citrus exports from Spain including sweet and bitter oranges, tangerines and lemons in the 1954-55 season are not expected to exceed 17 million boxes and may be as low as 15.5 million boxes. This will be 16 to 18 million boxes less than in 1953-54 and 13 to 15 million boxes less than total exports in the 1952-53 season. Observed infestations of the Mediterranean fruit fly and poor quality fruit indicate the lesser export estimate may be more correct.

Lemon production in Spain and Italy combined is estimated at 9 million boxes for 1954-55. This is 1.7 million boxes less than last year's crop after the Spanish freeze. The Italian winter lemon crop is about 20 percent smaller than last year, but the summer lemon crop is larger. The small Italian winter lemon crop will limit the production of lemon juice and essential oil. Prices of citrus products in Italy will be higher than last season.

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U.S. To Buy Canned Concentrated Orange Juice...

Intention to purchase canned concentrated orange juice from the 1954-55 crop for use in the National School Lunch Program was announced recently by the U. S. Department of Agriculture. Purchases will depend upon the quanity available for early delivery as well as total quantities and prices offered.

Details and specifications of the purchase have been mailed to orange concentrate canners. Offers of the canned concentrate orange juice should be submitted to the Fruit and Vegetable Division, Agricultural Marketing Service, U. S. Department of Agriculture, Washington 25, D. C., by December 20 for acceptance by December 22. The Department will require deliveries during the period January 10 through February 12.

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Ordinary vegetable-tanned insoles in shoes lasted about 70 percent longer when retanned with basic aluminum acetate (an alum) in U. S. Department of Agriculture tests.

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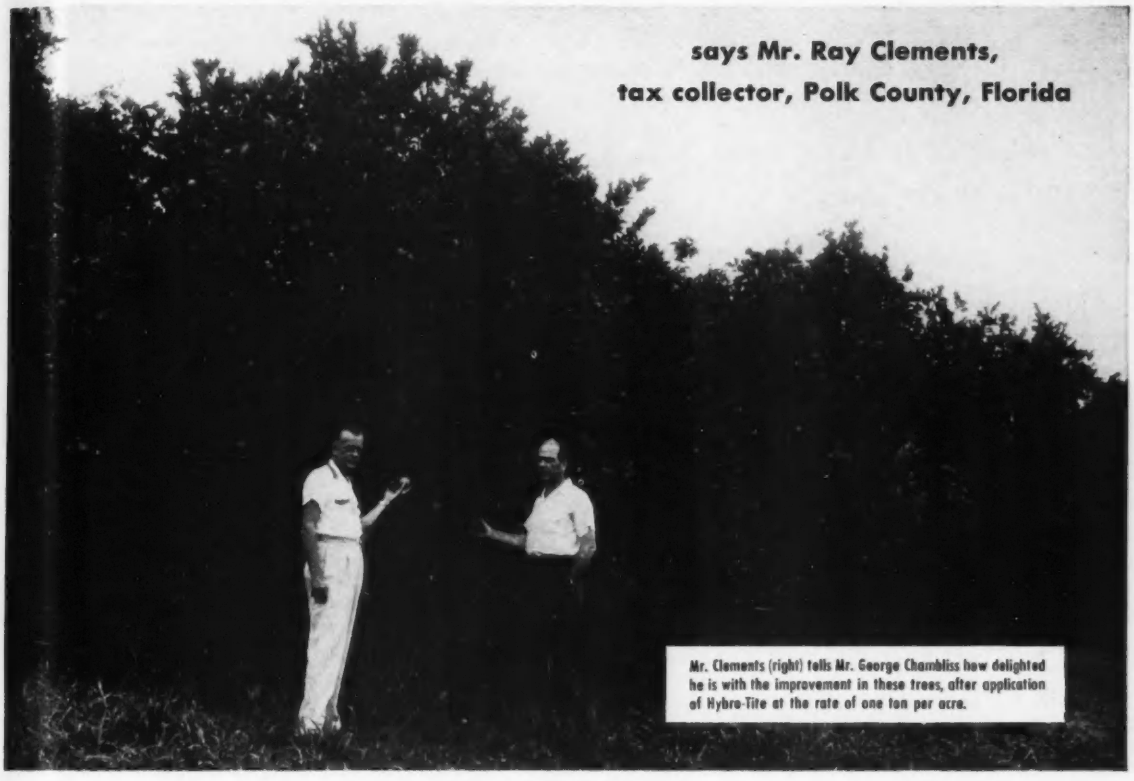

Mr. Clements (right) tells Mr. George Chambliss how delighted he is with the improvement in these trees, after application of Hybro-Tite at the rate of one ton per acre.

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Other citrus growers have found that Hybro-Tite-treated trees tend to develop better feeder root systems, and put out healthy, vigorous growth.

States a Lakeland, Florida, grower: "Hybro-Tite has done more good than anything we have ever used, *at less cost*."

A Winter Haven grower writes that after an initial application of Hybro-Tite, improvement in foliage and tree condition was so marked that he ordered a carload to be used as a general application on one grove! Still another grower reports a finer citrus crop, with early-maturing fruit and unusually high solids.

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